

AMENDMENTS

In the Specification

Please amend the specification as follows:

5 **Substitute the paragraph on page 1 with the following:**

Users appreciate knowing the amount of consumable supplies available in a printing device, marking material, for example, especially prior to starting a print or copy job. This is ~~particular~~ particularly true in the case of a remote printing device in which the user is working at a host computer that is
10 connected via some type of network to the remote printing device. Additionally, it is highly desirable to know and be able to track the amount of marking material consumed, not only on a per printed page or job, but also for a particular imaging apparatus or individual user or users. A user is, typically, unaware of the amount or condition of the consumable supplies, such as toner
15 or ink, available to the printing device prior to sending a print job. A frequent result of this unawareness is finding that the printing device ran out of ink or toner, or other consumable supply, in the middle of a print job at the time the user goes to the printing device to collect the print job. Typically, this results in a waste of both time and resources as the entire print job has to be printed a
20 second time after the printing device has been replenished with the appropriate consumable supplies.

Substitute the paragraph on page 2 with the following:

Most printers, copiers, and other imaging devices include the capability to measure or track and report consumable supplies such as ink or toner. Typically, an imaging device incorporates a monitoring or measuring device or sensor to detect and report the toner, ~~for example,~~ level in a toner cartridge. Additionally, some imaging devices include the capability to estimate or calculate the amount of marking material used or required to print an image. Typically, an imaging device operates by marking or not marking in a grid pattern of image elements, each element of the grid being referred to as a pel or sometimes as a pixel. It is ~~know~~ known to count the number of pels at which toner or ink is printed and the usage of marking material being determined from the number of pels counted. The amount of the beginning or full supply of marking material is known and an estimated remaining marking material is that amount calculated by subtracting the estimated usage.

Substitute the paragraph on page 2 with the following:

~~Conventional~~ For conventional imaging devices, such as printers and printer networks, in which the marking material usage is calculated, ~~typically~~ the calculation is typically performed prior to or during the printing of the print job. In most cases, this calculation can delay or interrupt one or more of the various processing tasks associated with printing the print job. These delays and interruptions can increase the time required to complete a print job thereby decreasing the printer efficiency and production. Additionally, in some printers, toner usage may be measured directly by gauges or sensors coupled directly to the toner or ink cartridge or reservoir. While providing useful information, the amount of toner used for a particular print job is calculated

after the fact and is based on a relatively inaccurate measurement of toner remaining in the reservoir.

Substitute the paragraph on page 3 with the following:

5 ~~According~~ Accordingly, there is a need for a method of calculating the amount of marking material required to print a print job that provides accurate, advance information and that does not significantly increase the amount of time required to complete the print job.

10 Substitute the paragraph on page 4 with the following:

In another preferred embodiment, the present invention may be implemented as a method for calculating the amount of marking material required to print a print job wherein the method preferably includes converting the print job at a host or client computer to a universal file format file, such as

15 Portable Document Format (PDF), for example, prior to transmitting the print job data file to a print server. At the print server, the universal file format file is copied and the copy is then used in a separate task running in the server background to calculate the amount of toner required to print the print job. As a first task, the server firstly converts the universal file format file to a page

20 description language (PDL) file, and then continues the conventional processing of the print job including at least the selection of an image-forming device for the print job and transmitting the print job to the selected image-forming device. As a ~~second~~, second task, the amount of toner required to print the print job includes converting the universal file format file to raster data,

25 counting the number of pels in the resulting bit map image for the print job, and calculating the amount of marking material required to print the print job using a predetermined amount of marking material for printing an individual pel.

Substitute the paragraph on page 5 with the following:

Referring now to Fig. 1, a computer network environment 10 including one or more image-forming devices 12 remotely coupled to one or more host computers 14 and 16 via a network or print server 18 over a communications network 20 is shown. The print server 18 is adapted to receive print jobs from the host computers over the communications network 20 and further distribute the print jobs to an appropriate image-forming device 12. For the purposes of this disclosure, the image-forming device 12 is in the form of a laser printer 12 that employs an electrophotographic drum imaging system, as well known in the art. However, as will be obvious to those of ordinary skill in the art, the present invention is similarly applicable to other types of printers and/or imaging devices including, for example, inkjet printers, facsimile machines, copiers, or the like. In a preferred embodiment, the communications network 20 is in the form of a local area network (LAN). Host computers 14, 16, print server ~~and~~ 18, and laser printer(s) 12 ~~10~~ can be connected together via JETADMIN LAN ~~ethernet~~ Ethernet connections available from Hewlett-Packard Company. Preferably, corresponding hardware includes a JetDrive multiprotocol EIO, which is an ~~ethernet~~ Ethernet card that spools out print jobs from the network 20 and is available from Hewlett-Packard Company. However, in other embodiments, the communications network 20 may be a wide area network (WAN) or the ~~internet~~, Internet, for example, via which a host computer may be directly connected to a printing device. Any one of the host computers 14 and 16 can send a print job to the print server 18. The print server 18 includes one or more printer drivers (not shown) for formatting print jobs for delivery to an appropriate printer 12.

Substitute the paragraph on page 7 with the following:

With continuing reference to Fig. 1, in a conventional computer or printer network, a print job may be transmitted from a host or client computer 14, 16 to a print server 18. The print server 18, then, based on the print job requirements and other factors, determines an appropriate printer 12 and sends the print job to the selected printer, such as a laser printer 12, for example. At the printer 12, the print job is handled as discussed above to complete the print job and generate a printed output. According to the principles of the present invention, the print server 18 is adapted to calculate the amount of marking material, toner, for example, required to actually print the print job. In a preferred embodiment, calculation of the amount of marking material, such as toner, required to print a print job involves counting the number of image elements (pels) defining the print job and multiplying a known amount of marking material required to print an individual image element by the number of image elements contained in the print job. According to the present invention, the print server 18 includes a calculation module 17 which implements logic that converts the print data from a print job to raster data (i.e., a bit map) and then counts the image elements or pels contained in the print job. Using the amount of toner required to print an individual pel, the total amount of toner required to print an image is calculated from the pel count. The amount of toner required to print an individual pel may be determined by several known methods, for example, many printers include the capability to maintain a history of total number of pels printed versus total amount of toner used over all or selected periods of a printer lifetime. Additionally, as is known in the art, other methods of calculating the amount of marking material required to print a print job may be utilized in the present invention. For example, the amount of marking material required to cover 100 percent of a

page is determined; then for each page of a print job, the percentage coverage is determined and multiplied by the amount of marking material required for 100 percent coverage. To minimize or prevent interrupting or delaying the print job, a copy of the print data is made and the toner calculation is completed
5 as a separate task in the background while the print server continues to process the print job and send it on to a printer 12.

Substitute the paragraph on page 8 with the following:

Referring now also to Fig. 4, a flow chart depicting a preferred method
10 of calculating the marking material required to print an image or document according to the principles of the present invention is shown. The process 100 allows a print job to be completed without significant interruptions or delays while also calculating the amount of marking material, such as toner, required to print the image or document. Process 100 begins at step 102 when a user at
15 a client computer 14 submits a print job, such as a document drafted in a word processing application, for example. Submission of a print job includes the image data stream and all control instructions directing how the document is to be printed. Prior to transmission to the print server 18, the print job is converted at step 104 to a universal file format, such as a PDF file for this
20 example, using PDF conversion software application 13, 15, for example. At the print server 18, the handling of the print job processes as two separate processes. The print job PDF file is copied at step 108, and the toner calculation process proceeds as a separate task running in the server background. At step 110, PDF file print data is converted to raster data. The
25 dots or pels in the image bit map thus generated are counted at step 112 and multiplied times the amount of toner required to print an individual pel to calculate the total amount of toner required to print the document image at step

114. Returning to step 106, the print server 18 continues to process the submitted print job. At step 116, the print job PDF file is converted to a PDL file using a universal file format reader, such as a PDF reader application, for example, in conjunction with an appropriate printer driver and sent on to a
5 selected printer 12 at step 118.

Substitute the paragraph on page 9 with the following:

The logic which comprises an ordered listing of executable instructions for implementing logical ~~functions~~, functions can be embodied in any
10 computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. In the context of this document, a computer-readable medium can
15 be any means that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device. The computer-readable medium can be, for example, but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More
20 specific examples (a nonexhaustive list) of the computer-readable medium would include the following: an electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM)(magnetic), a read-only memory (ROM)(magnetic), an erasable programmable-read-only memory (EPROM or Flash memory), an optical fiber
25 (optical), and a portable compact disc read-only memory (CDROM) (optical). Note that the computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be

electronically captured, via for instance optical scanning of the paper or other medium, then compiled, interpreted or otherwise processed in a suitable manner if necessary, and then stored in a computer memory.